

**Work Order ID 68821**

Thursday, April 21, 2011 10:50:37 AM



Page 1

Item ID: D350-748-141TRN

Accept



Setup Start



Revision ID:

Stop



Item Name: Crosstube Turning Detail

Start Date: 4/21/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 5/28/2011 Req'd Qty: 1.00



Customer:

Reference:

Approvals:

Process Plan: 

Date: \_\_\_\_\_

Tooling: \_\_\_\_\_

Date: \_\_\_\_\_

Run Start



QC: \_\_\_\_\_

Date: \_\_\_\_\_

SPC (Y/N): \_\_\_\_\_

Date: \_\_\_\_\_

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

Draw Nbr

Revision Nbr

D350-748-141

Rev F

100

0.00



MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs on both ends as per Folio FA648  
2-Turn first side as per Folio FA648  
3- File transition lines smooth.

mmc 11/07/07

110

0.00



QC1- Inspect dimensions to dimension sheet

QC

Memo

0.00

Quality Control

mmc 11/07/07

120

0.00



MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Turn second side as per Folio FA648  
2- File transition lines smooth.  
3-Scribe Part & Batch as per Dwg D350-748-141

mmc 11/07/07

H-11

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
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Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

130

QC1- Inspect dimensions to dimension sheet

0.00



QC

Memo

0.00

SAD 11/07/07

1 0

Quality Control

140

QC8- Inspect parts - second check

0.00



QC

Memo

0.00

SAD 07-08

1 0

Quality Control

150

Large Fab

0.00



Crosstubes

Memo

0.00

SAD 11-07-07

0

Crosstubes

Grind machining marks

W/O:		WORK ORDER CHANGES					
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Page 3

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Start Date: 4/21/2011 Start Qty: 1.00



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Required Date: 5/28/2011 Req'd Qty: 1.00



Customer:

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Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
160  Outsource1	Outsource process - Heat Treat	0.00							
Outsource process - Heat Treat	<b>Memo</b> Issue P/O: <u>14464</u> Heat Treat to min 180 KSI As per Dwg D350-748-141 (MIL-T-6736 OR AMS 2759-1C) Sand Blast tube after Heat Treat Possible Supplier: Vac Aero Ensure Certificate of Conformity is attached	0.00							<u>CL</u> <u>11/07/12</u> <u>①</u>
170  Packaging	Receive & Inspect for Damage & Mat'l Certs	0.00							
Packaging	<b>Memo</b> Ensure certificate of conformaty is attached	0.00							<u>P-4/8/12</u> <u>①</u>
180  QC	QC6- Inspect dimensions to drawing	0.00							
Quality Control	<b>Memo</b>	0.00							<u>①</u>

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QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

190



Packaging

Packaging

0.00

Memo

0.00

Identify and stock in kanban rack  
Location: 4/6

11-8-2

200



QC

QC21- Final Inspection - Work Order Release

0.00

Memo

0.00

ck 11/08/03

Quality Control

11-08-2.

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# Picklist Print

Thursday, April 21, 2011 10:50:34 AM

Page 1

Work Order ID: 68821



Parent Item: D350-748-141TRN



Parent Item Name: Crosstube Turning Detail


Start Date: 4/21/2011

Required Date: 5/28/2011

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A New Issue 08-03-06 DD verified by:ec  
IPP Rev B Removed polish 08.04.02 EC verified by : DD  
IPP Rev C Remove LPS-3 08.06.23 EC verified by DD IPP Rev C  
11.02.24 as per dwg rev.F DD verf: JLM

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6015-125  Crosstube Material		Manufactured	No			110	Each	61.0000	1	1			

Location

HALL

Loc Qty

61

61

Loc Code

61380

mm. 6 11/07/07

W/O:		WORK ORDER CHANGES					
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Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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<b>DART AEROSPACE LTD</b>	<b>Work Order:</b> 68821
<b>Description:</b> Crosstube Assembly (AS350/355 High Fwd)	<b>Part Number:</b> D350-748-141
<b>Inspection Dwg:</b> D350-748-141 <b>Rev:</b> <del>EF</del> R 11-08-03	<b>Page 1 of 1</b>

### FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet	Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+0.005/-0.000	2.245	/		mic	CNC-01
	2.180	+0.005/-0.000	2.185	/		"	
	2.180	+0.005/-0.000	2.185	/		"	
	2.237	+0.005/-0.000	2.242	/		"	
	2.272	+0.005/-0.000	2.276	/		"	
	2.306	+0.005/-0.000	2.308	/		"	
	2.339 +.007	+0.005/-0.000	2.345	/		"	
	2.339 +.007	+0.005/-0.000	2.345	/		"	
	0.062	+/-0.010	.062	/		vern	JF-01
	4.26	+/-0.030	4.275	/		"	
	R0.063	+/-0.010	0.063	/		RG	
	R0.50	+/-0.030	.500	/		"	
SIDE B	2.240	+0.005/-0.000	2.245	/		mic	CNC-01
	2.180	+0.005/-0.000	2.185	/		"	
	2.180	+0.005/-0.000	2.185	/		"	
	2.237	+0.005/-0.000	2.242	/		"	
	2.272	+0.005/-0.000	2.277	/		"	
	2.306	+0.005/-0.000	2.309	/		"	
	2.339 +.007	+0.005/-0.000	2.346	/		"	
	2.339 +.007	+0.005/-0.000	2.345	/		"	
	0.062	+/-0.010	.062	/		vern	JF-01
	4.26	+/-0.030	4.275	/		"	
	R0.063	+/-0.010	.063	/		RG	
	R0.50	+/-0.030	.500	/		"	
	110.27	+/-0.060	110.260	/		ntype	man.L-02

<b>Measured by:</b> Mgm. Clark	<b>Audited by:</b> [Signature]	<b>Preliminary Approval:</b>
<b>Date:</b> 11/07/07	<b>Date:</b> 11-07-08	<b>Date:</b>

Rev	Date	Change	Revised by	Approved
A	06.11.09	New Issue (P/O D350-748-101)	KJ/JLM	
B	07.10.24	Dwg Rev updated	KJ/EC/DD	
C	11.01.20	Dwg Rev updated	KJ	

W/O:		WORK ORDER CHANGES					
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Item	Qty -141	Part Number	Description
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

#### GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115  
FINISHED LENGTH = 110.270±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART PART NUMBER 'D350-748-141' AND BATCH NUMBER ON INSIDE OF CUFF  
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 30.45 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.  
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN.-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN			
DRAWN			
CHECKED			
MFG. APPR.			
APPROVED			
DE APPR.			
DATE	10.11.23		

<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
DRAWING NO. D350-748-141	REV. F SHEET 1 OF 4
TITLE CROSSTUBE (AS 350/355 HI FWD)	SCALE NTS
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RELEASED  
2011-01-18

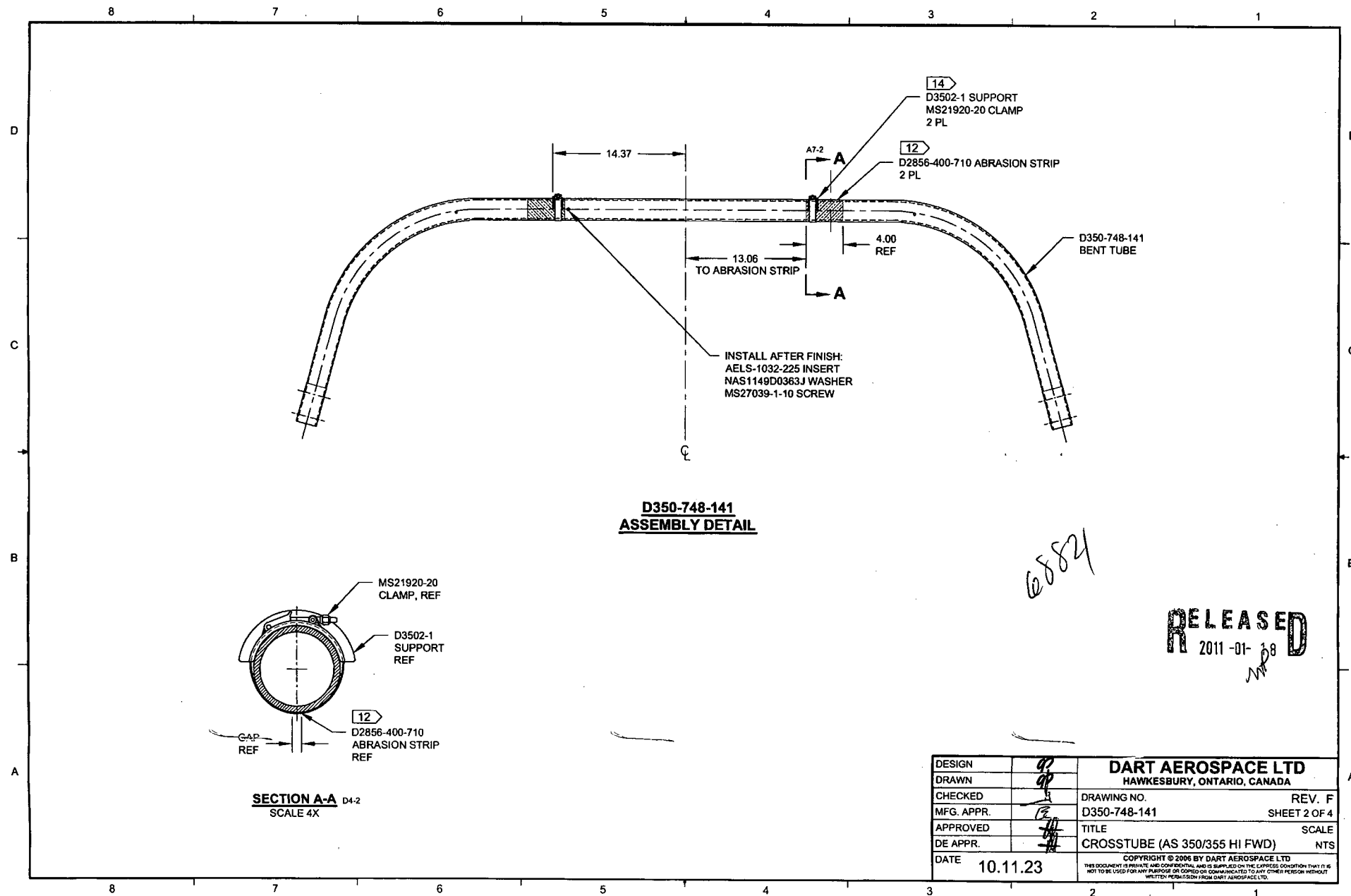
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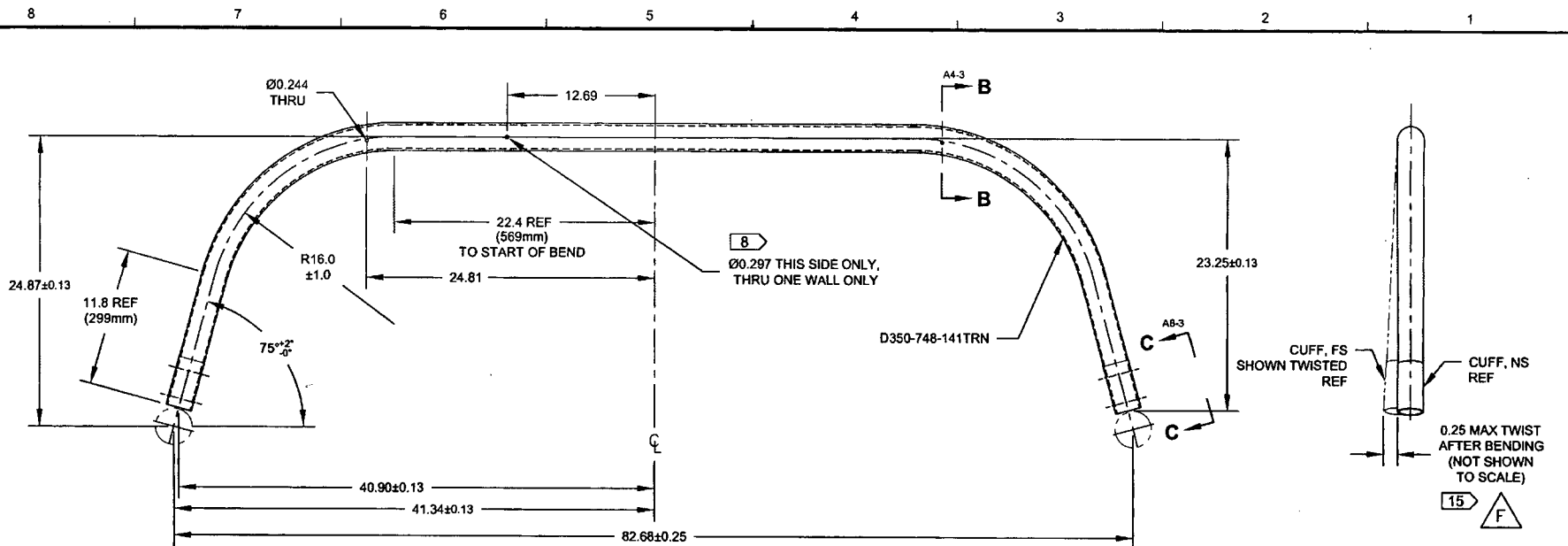
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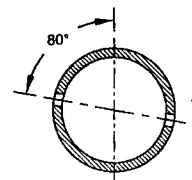
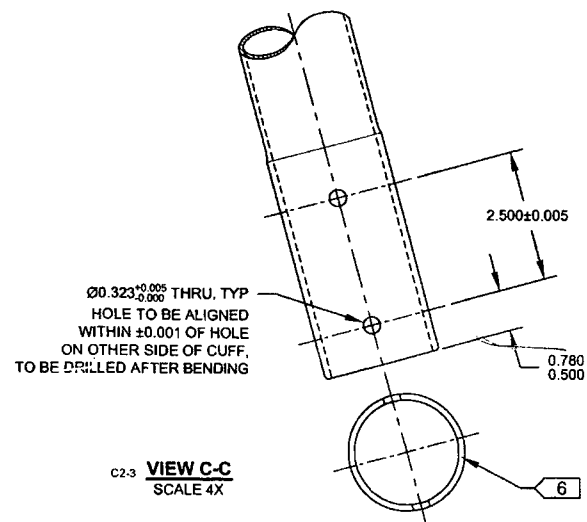
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**D350-748-141**  
**BENDING AND DRILLING DETAIL** 10



**SECTION B-B** D3-3  
SCALE 4X

DESIGN	9P	<b>DART AEROSPACE LTD</b>	
DRAWN	9P	HAWKESBURY, ONTARIO, CANADA	
CHECKED	B	DRAWING NO.	REV. F
MFG. APPR.	3	D350-748-141	SHEET 3 OF 4
APPROVED	1	TITLE	SCALE
DE APPR.	1	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD</small>	

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2011-01-18

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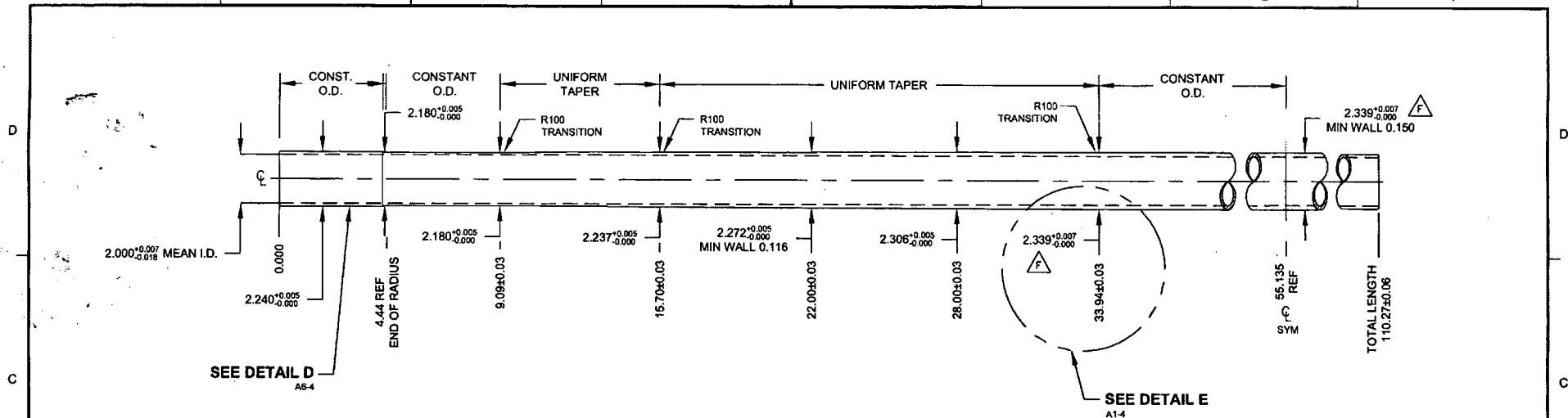
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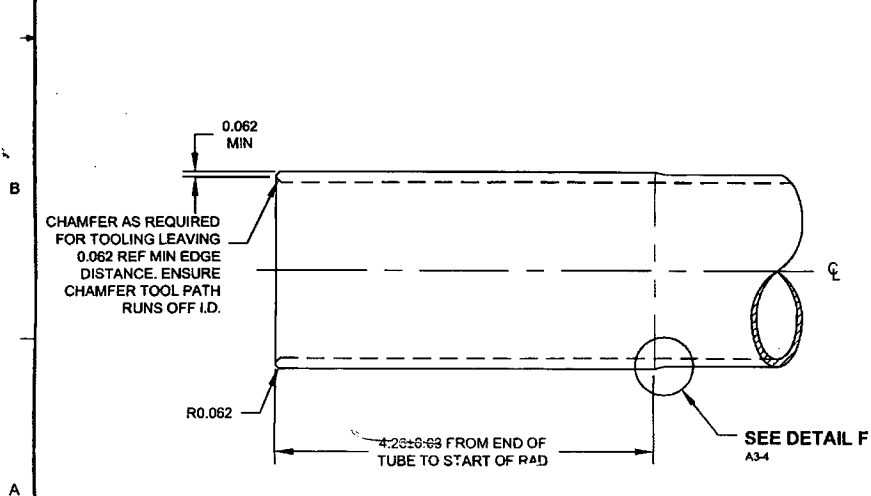
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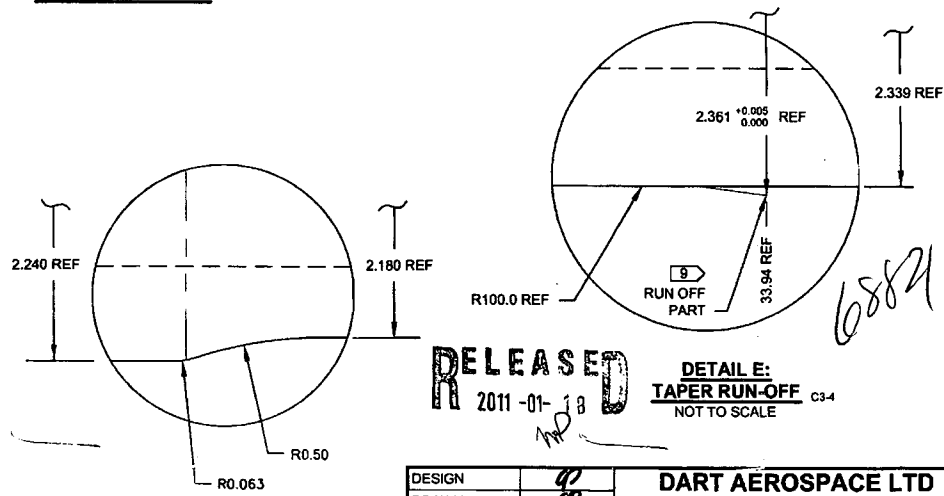
8 7 6 5 4 3 2 1



**D350-748-141TRN**  
**TURNING DETAIL**



**DETAIL D:**  
**CROSTUBE CUFF** C7-4  
SCALE 3X



**DETAIL F:**  
**CUFF TRANSITION** A5-4  
NOT TO SCALE

**RELEASED**  
2011-01-18

**DETAIL E:**  
**TAPER RUN-OFF** C3-4  
NOT TO SCALE

DESIGN	90	<b>DART AEROSPACE LTD</b>	
DRAWN	90	HAWKESBURY, ONTARIO, CANADA	
CHECKED	13	DRAWING NO.	REV. F
MFG. APPR.	13	D350-748-141	SHEET 4 OF 4
APPROVED	13	TITLE	SCALE
DE APPR.	13	CROSTUBE (AS 350/355 HI FWD)	NTS
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**VAC AERO**  
INTERNATIONAL INC.

# PACKING SLIP

OAK 132337-1



HEAD OFFICE  
1371 SPEERS ROAD, OAKVILLE, ONTARIO  
CANADA L6L 2X5  
TEL: (905) 827-4171 FAX: (905) 827-7489



QUEBEC DIVISION  
7450 RUE VÉRITÉ STREET, ST. LAURENT, QUÉBEC  
CANADA H4S 1C5  
TEL: (514) 334-4240 FAX: (514) 334-6269

GST No.: R105468102

07/29/2011

MM / DD / YYYY

PAGE: 1

1DAR01

BILL TO: DART AEROSPACE LTD.  
1270 ABERDEEN ST.  
HAWKESBURY, ON

SHIP TO: DART AEROSPACE LTD.  
1270 ABERDEEN ST.  
HAWKESBURY, ON

K6A 1K7

K6A 1K7

DATE SHIPPED	SHIP VIA	F.O.B.
07/29/2011		ORIGIN
CUSTOMER P/O No.	JOB No.	TERMS
14464		NET 30 DAYS

LN	PART NO	DESCRIPTION	UOM	QTY ORDERED	QTY SHIPPED	B/O QTY
01	D350-748	-141 TRN CROSS TUBE	EA	6	6	0
Process Specifications: Procedure: 4353 HEAT TREATED TO 180 KSI MIN. PER AMS 2759-1E 100% HARDNESS CHECKED AS PER ASTM E-18, 40/45 HRC MATERIAL: 4130  PARTS WERE GRIT BLASTED  S/N B68818, B68819, B68821 B68827, B70648, B71614  NOTE: NO SERIAL NUMBERS FOUND ON PARTS						
02	MC	MINIMUM CHARGE		1	1	0
03	GB	GRIT BLASTING		1	1	0

No claims for shortage in weight or count will be entertained, unless presented within 5 working days after receipt of materials by customer.



METAL TREATING INSTITUTE



VACUUM BRAZING · HEAT TREATING · SPECIAL PROCESSING · FURNACE EQUIPMENT  
TURNING COMPONENT OVERHAUL · PLASMA AND OTHER COATINGS



# VAC AERO

INTERNATIONAL INC.

## RELEASE NOTE

GST No.: R105468102

OAK 132337-1



**HEAD OFFICE**

1371 SPEERS ROAD, OAKVILLE, ONTARIO  
CANADA L6L 2X5  
TEL: (905) 827-4171 FAX: (905) 827-7489



**2009 WYECROFT ROAD, UNIT B**

OAKVILLE, ONTARIO  
CANADA L6L 6J4  
TEL: (905) 827-7377 FAX: (905) 827-1380



**QUEBEC DIVISION**

7450 RUE VERITÉ STREET, ST. LAURENT, QUÉBEC  
CANADA H4S 1C5  
TEL: (514) 334-4240 FAX: (514) 334-6269

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DATE SHIPPED	SHIP VIA	F.O.B.
07/29/2011		ORIGIN
CUSTOMER P/O No.	JOB No.	TERMS
14464		NET 30 DAYS

PART No.	DESCRIPTION	UOM	QTY ORD	QTY SHPD	TEST RESULTS
D350-748	-141 TRN CROSS TUBE	EA	6	6	
<p>Process Specifications: Procedure: 4353 HEAT TREATED TO 180 KSI MIN. PER AMS 2759-1E 100% HARDNESS CHECKED AS PER ASTM E-18, 40/45 HRC MATERIAL: 4130</p> <p>PARTS WERE GRIT BLASTED</p> <p>S/N B68818, B68819, <u>B68821</u> B68827, B70648, B71614</p> <p>NOTE: NO SERIAL NUMBERS FOUND ON PARTS</p>					

100% HARDNESS TESTED

6pc - 44/45 HRC

VAC AERO  
2011  
JUL 29/11

I hereby certify that the material covered by this release note has been inspected and tested and conforms to all specifications relevant thereto in accordance with the conditions of the contract / or purchase order.

ON BEHALF OF VAC AERO INTERNATIONAL INC.

Authorized O.C. Inspector



Accredited  
**Nadcap**  
Heat Treating • Welding



METAL TREATING INSTITUTE

VACUUM BRAZING • HEAT TREATING • SPECIAL PROCESSING • FURNACE EQUIPMENT  
TURBINE COMPONENT OVERHAUL • PLASMA AND OTHER COATINGS